SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

SAMPLE OPEN-RESPONSE QUESTION

How do students provide evidence of what they know and can do in mathematics?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of mathematics:

Postal Rates

Susan is going to the post office to mail six items. For each item, the post office charges 33¢ for the first ounce of mail and 23¢ for each additional ounce.

a. Copy and complete the table below in your Student Response Booklet showing how much it would cost Susan to mail **each** of her six items if the first item weighs one ounce, the second item weighs two ounces, the third item weighs three ounces, and so on up to the sixth item which weighs six ounces.

ounces	cost
1	
2	
3	
4	
5	
6	

b. How much would it cost Susan to mail an item that weighs 25 ounces?

c. Write an expression that shows the cost of mailing an item that weighs *n* ounces, and explain your reasoning.

MATHEMATICS CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Postal Rates" addresses the following Mathematics Academic Expectations: "Students use mathematical ideas and procedures to communicate, reason, and solve problems" (1.5-1.9); "Students understand various mathematical procedures and use them appropriately and accurately" (2.8); and "Students understand mathematical change concepts and use them appropriately and accurately" (2.11).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Mathematics Assessment*. Most importantly, students are asked to demonstrate their understanding of how to use basic operations (i.e., addition and multiplication) with decimals. In addition, students are asked to show their understanding of patterns, pattern extensions, mathematical functions, algebraic expressions, and the relationship of these concepts to each other.

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of a student's ability to compute with decimals, to represent data in table form, to interpret a pattern shown by data in table form, to extend that pattern, and to express in algebraic form a rule for that pattern.

For example, an appropriate response to this question would show that the student can

- accurately use different operations (i.e., addition and multiplication) with decimals to determine the cost of each of six items;
- display the individual costs of six items in table form;
- interpret the pattern generated by the data in the table;
- accurately extend the pattern sequence shown in the table to determine the cost of an item that weighs 25 ounces;
- accurately write an algebraic expression that generalizes the cost of mailing an item that weighs *n* ounces; and
- clearly and accurately explain how the algebraic expression was determined.

Successful student work should provide convincing evidence that the student can use mathematical knowledge to address the relevant issue(s), although the response may not address all details and may contain minor mathematical errors.

APPLICATIONS

How is this relevant?

By successfully addressing this question, students demonstrate an ability to compute with decimals, as well as to identify a numeric pattern, extend that pattern, and express a rule for that pattern in algebraic form. The ability to compute with decimals will be useful to students throughout school and in their adult life. The ability to identify a numeric pattern, extend that pattern, and express a rule for that pattern in algebraic form is useful in many real-world contexts such as determining pricing for a business, making investment decisions, and predicting population trends.

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

SAMPLE OPEN-RESPONSE QUESTION

How do students provide evidence of what they know and can do in mathematics?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of mathematics:

Tasha and Kelly's TV Channels

Tasha and Kelly are watching television, each in her own home. Tasha can get five cable channels, but Kelly can get only four. The charts below show the channels that each girl receives.

Tasha's Channels
A
B
C
D
E

Kelly's Channels
A
B
F
G

a. List all possible combinations of channels that can be watched by the two girls. Show your work.

b. What is the theoretical probability that Tasha and Kelly are watching the same channel? Show your work or explain your reasoning.

c. What is the theoretical probability that they are watching different channels? Show your work or explain your reasoning.

MATHEMATICS CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Tasha and Kelly's TV Channels" addresses the following Mathematics Academic Expectations: "Students use mathematical ideas and procedures to communicate, reason, and solve problems" (1.5.-1.9), and "Students understand and appropriately use statistics and probability" (2.13).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Mathematics Assessment*. Students are asked to demonstrate their understanding of techniques used to organize data such as charts, lists, or tree diagrams. In addition, students are asked to use an organizational technique to list all combinations possible in a probability problem and to determine the theoretical probability of specific events occurring.

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of a student's understanding of combination and probability problems and techniques to solve those problems.

For example, an appropriate response to this question would show that the student can

- clearly understand the parameters of a counting problem (i.e., Tasha can get five channels and Kelly can get four channels);
- use an appropriate counting technique to determine all possible combinations of channels that can be watched by the two girls;
- correctly list all possible combinations of channels that can be watched by the two girls;
- accurately determine the theoretical probability that the two girls are watching the same channel;
- accurately determine the theoretical probability that the two girls are watching different channels; and
- clearly and accurately explain how the theoretical probability was determined for both events.

Successful student work should provide convincing evidence that the student can use mathematical knowledge to address the relevant issue(s), although the response may not address all details and may contain minor mathematical errors.

APPLICATIONS

How is this relevant?

By successfully addressing this question, students demonstrate an ability to use counting techniques to solve probability problems. Students may use this ability in school (e.g., to organize groups for activities and sports teams) and in adult life (e.g., to create schedules and committees in business or social organizations). The ability to determine probability is also useful in activities such as determining the fairness of games or creating games that are fair.

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

SAMPLE OPEN-RESPONSE QUESTION

How do students provide evidence of what they know and can do in mathematics?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of mathematics:

Block Figures

Brad wants to make a sandbox in the shape of a rectangle. He plans to cut a 16-foot-long piece of wood into four pieces and use each piece to make a side of the sandbox.

a. Copy and complete in your Student Response Booklet the chart below listing **four** possible pairs of dimensions (length and width) for the sides of the sandbox.

length (l)	width (w)

b. Using the pairs in your chart from **part a**, graph the points on the grid provided in your Student Response Booklet. Label the axes of your graph as *l* and *w*.

c. Given the pairs of numbers in your chart, what is the relationship between the length and width of the sandbox?

MATHEMATICS CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Block Figures" addresses the following Mathematics Academic Expectations: "Students use mathematical ideas and procedures to communicate, reason, and solve problems" (1.5-1.9); "Students understand space and dimensionality concepts and use them appropriately and accurately" (2.9); "Students understand measurement concepts and use measurements appropriately and accurately" (2.10); and "Students understand mathematical change concepts and use them appropriately and accurately" (2.11).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Mathematics Assessment*. Most importantly, students are asked to show their understanding of the formula for perimeter and how to use this formula to find measurements of two-dimensional shapes (i.e., rectangles). In addition, students are asked to show their understanding of how to display data (i.e., length and width variables) in different ways (i.e., in a chart and on a graph) and how to use these different representations of data to describe a relationship between two measurements (i.e., length and width).

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of the student's understanding of the formula for perimeter as well as of the student's ability to chart and graph data.

For example, an appropriate response to this question would show that the student can

- correctly identify four pairs of variables (i.e., the dimensions of length and width) for the sides of the sandbox;
- accurately construct two representations of the pairs of variables (i.e., construct a chart and a graph);
- correctly label the axes of the graph; and
- clearly explain the functional relationship between the variables (i.e., between the length and the width measurements of the sandbox).

Successful student work should provide convincing evidence that the student can use mathematical knowledge to address the relevant issue(s), although the response may not address all details and may contain minor mathematical errors.

APPLICATIONS

How is this relevant?

By successfully addressing this question, students demonstrate the ability to calculate possible lengths and widths of a two-dimensional figure (i.e., a rectangle) that has a given perimeter. This ability is useful in fields such as design and construction.

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

SAMPLE OPEN-RESPONSE QUESTION

How do students provide evidence of what they know and can do in mathematics?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of mathematics:

Olympic 200-Meter Times

Use the table below to answer the question.

Olympic 200-Meter Backstroke

YEAR	TIME	COUNTRY
1968	2:24	United States
1972	2:19	United States
1976	2:13	E. Germany
1980	2:11	E. Germany
1984	2:12	Netherlands
1988	2:09	Hungary
1992	2:07	Hungary
1996	2:08	Hungary

The women's 200-meter backstroke is one event of the summer Olympics, which are held every four years. The table above shows the winning times (in minutes and seconds) of the event since 1968.

a. Graph the numeric data from the table on the grid provided in your Student Response Booklet.

b. Describe the trend that is displayed by the graph.

c. Based on the data and your graph, predict a reasonable winning time for the women's 200-meter backstroke in the year 2000. Explain your reasoning.

SPRING 1999 RELEASE ITEM
Grade 8 Mathematics

MATHEMATICS CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Olympic 200-Meter Times" addresses the following Mathematics Academic Expectations: "Students use mathematical ideas and procedures to communicate, reason, and solve problems" (1.5-1.9); "Students understand mathematical change concepts and use them appropriately and accurately" (2.11); and "Students understand and appropriately use statistics and probability" (2.13).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Mathematics Assessment*. In addition to the basic concept of graphing, students are asked to show their understanding of the relationship between different representations of data (i.e., data in table form and graphed data) and of how to use these different representations of data to make a prediction.

PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of a student's ability to interpret data in a table, to represent this data in another form (i.e., a graph), and to make a reasonable prediction based on the pattern shown by the different representations of data.

For example, an appropriate response to this question would show that the student can

- accurately interpret numeric data (i.e., the winning backstroke times for different years) displayed in table form;
- construct a graph based on the numeric data in the table;
- accurately describe the trend (i.e., pattern) that is displayed by the graphed data;
- make a reasonable prediction of the winning backstroke time in the year 2000 based on the different representations of data (i.e., the data table and the graph); and
- clearly and accurately explain the reasoning behind the prediction.

Successful student work should provide convincing evidence that the student can use mathematical knowledge to address the relevant issue(s), although the response may not address all details and may contain minor mathematical errors.

APPLICATIONS

How is this relevant?

By successfully addressing this question, students demonstrate an ability to identify a pattern based on different representations of data and to generate a prediction based on that pattern. This ability is useful in many real-world contexts such as determining future inventory needs for a business, making investment decisions, or predicting lifespans of different segments of the population.